TECHNICAL USER'S MANUAL FOR:

MICROSPACE®

PC/104 Peripheral boards

MSMVGA

65545 based VGA/LCD controller

#260399-1

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		V0.2	02.99 JM	Jumper Location
	V1.0	***V1.0***	***03.99 JM***	***Released Version***

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1 PREFACE

This manual is for integrators and programmers of systems based on the MICROSPACE card family. It contains information on hardware requirements, interconnections, and details of how to program the system. The specifications given in this manual were correct at the time of printing; advances mean that some may have changed in the meantime. If errors are found, please notify DIGITAL-LOGIC AG at the address shown on the title page of this document, and we will correct them as soon as possible.

1.1 How to use this Manual

This manual is written for the original equipment manufacturer (OEM) who plans to build computer systems based on the single board MICROSPACE-PC. It provides instructions for installing and configuring the MSMVGA board, and describes the system and setup requirements.

1.2 Trademarks

Chips & Technologies SuperState R
MICROSPACE, MicroModule DIGITAL-LOGIC AG
DOS Vx.y, Windows Microsoft Inc.
PC-AT, PC-XT IBM
NetWare Novell Corporation
Ethernet Xerox Corporation
DR-DOS, PALMDOS Digital Research Inc. / Novell Inc.
ROM-DOS Datalight Inc.

1.3 Disclaimer

DIGITAL-LOGIC AG makes no representations or warranties with respect to the content of this manual and specifically disclaims any implied warranty of merchantability or fitness for any particular purpose. DIGITAL-LOGIC AG shall under no circumstances be liable for incidental or consequential damages or related expenses resulting from the use of this product, even if it has been notified of the possibility of such damage. DIGITAL-LOGIC AG reserves the right to revise this publication from time to time without obligation to notify any person of such revisions. If errors are found, please contact DIGITAL-LOGIC AG at the address listed on the title page of this document.

1.4 Who should use this product

- Electronic engineers with know-how in PC-technology.
- Without electronic know-how we expect you to have questions. This manual assumes, that you have a general knowledge of PC-electronics.
- Because of the complexity and the variability of PC-technology, we can't give any warranty that the product will work in any particular situation or combination. Our technical support wil help you.
- Pay attention to the electrostatic discharges. Use a CMOS protected workplace.
- Power supply OFF when you are working on the board or connecting any cables or devices.

This is a high-technology product.
You need know-how in electronics and PC-technology to install the system !

1.5 Recycling Information

Hardware:	**- Print:**	epoxy with glass fiber wires are of tin-plated copper
	- Components:	ceramics and alloys of gold, silver check your local electronic recycling
Software:	**- no problems:**	re-use the diskette after formatting

1.6 Technical Support

1. Contact your local Digital-Logic Technical Support in your country.
2. Use Internet Support Request form on http://www.digitallogic.ch -> support
3. Send a FAX or an E-mail to DIGITAL-LOGIC AG with a description of your problem.

DIGITAL-LOGIC AG
Technical Support Dept.
Nordstrasse 11/F
CH-4542 Luterbach (SWITZERLAND)

Fax: ++41-32 681 53 31
E-Mail: support@digitallogic.ch

➔ Support requests will only be accepted with detailed informations about the product (BIOS, Board Version) !

1.7 Limited Warranty

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2 MSMVGA SPECIFICATIONS

Controller:	65545 from C&T
Enhanced BIOS:	VGA / LCD BIOS MultiBios Feature
Default Panels:	1. CRT and MONO-LCD Type Sharp Mono LM64P8XX 2. CRT and TFT LCD Type Sharp TFT LQD011 and Toshiba TFT LTM9C015 3. CRT and STN-Color LCD Type Torisan STN Color LMCA53/22NAZ 4. CRT and EL-Plasma Type Sharp TFT LQ10DH11
Memory:	DRAM onboard: 1 MByte
CRT-Monitor:	VGA / SVGA
Resolution:	up to 768 x 1024 Pixel 64k Colors
Flatpanel-Display:	TFT: 640 x 480 , 800 x 600, 1024 x 768 with 8,9,12,15,16,18 Bits STN: 640 x 480 , 800 x 600, 1024 x 768 Monochrome STN: 640 x 480 with 64 colors 2-2/3 and 5-1/3 bit DD and SS Plasma:640 x 480 to 1280 x 1024 EL: 640 x 350 , 640 x 480, 768 x 1024 Pixels
Connectivity:	CRT only Flatpanel only CRT and Flatpanel (Default) simultaneous
Contrast Control:	10kOhm software controlled resistor with 100 steps
Backlight Control:	10kOhm software controlled resistor with 100 steps
Frame Buffer:	64k advanced frame buffer architecture
Supported Standard Panels with MultiBIOS:	CRT simultaneous with: 1. MONO STN 2. TFT - FP 3. STN-Color FP 4. EL Panel see also Flatpanel Support Manual by DIGITAL-LOGIC AG; list with already adapted flatpanels
Bus:	Standard: PC/104 Size: 16 Bit only
Power Supply:	Power Normal: 5V/260mA Power Suspend: 5V/200mA Power Sequencing: control by 65545 for VCC, Bias, Backlight Bias Voltage: -30 to +30 Volt, 40mA
Physical Characteristics:	Dimension: Length: 96 mm Width: 90 mm Height: 20 mm
Operating Environment:	Relative humidity: 5 - 90 % non condensing Vibration: 5 to 2000 Hz Shock: 10 g Temperature: Operating: -25°C to +70°C Extended: -25°C to +85°C
Ordering Information:	
MSMVGAL	PC/104 VGA Board with VEE Voltage generation
MSMVGA	PC/104 VGA Board without VEE-Voltage generation (CRT and TFTs)

Any information is subject to change without notice.

3 VGA, LCD

3.1 VGA / LCD Controller 65540/45

The 65540 High Performance Flatpanel/CRT VGA controller

- High integrated design (flatpanel/CRT VGA controller, RAMDAC, clock synthesizer)
- Local Bus (32 Bit CPU)
- Flexible display memory configurations
  – Two 256Kx16 DRAM (1024 KB)
- Advanced frame buffer architecture uses available display memory, maximizing integration and minimizing chip count
- Integrated programmable linear address feature accelerates GUI performance
- Hardware windows acceleration (65545)
  - 32-Bit graphics engine
    - System-to-screen and screen-to-screen BitBlt
    - 3 operand ROPs
    - Color expansion
    - Optimized for Windows™ BitBlt format
  - Hardware line drawing
  - 64x64x2 hardware cursor
- Hardware pop-up icon (65545)
  - 64x64 pixels by 4 colors
  - 128x128 pixels by 2 colors
- High performance resulting from zero wait-state writes (write buffer) and minimum wait-state reads (internal asynchronous FIFO design)
- Mixed 3.3 V / 5.0 V +/- 10 % Operation
- Supports panel resolutions up to 1280 x 1024, including 800x600 and 1024x768
- Supports non-interlaced CRT monitors with resolutions up to 1024 x 768 / 256 colors
- True-color and Hi-color display capability with flatpanels and CRT monitors up to 640x480 resolution
- Direct interface to Color and Monochrome Dual Drive (DD) and Single Drive (SS) panels (supports 8, 9, 12, 15, 16, 18 and 24-Bit data interfaces)
- Advanced power management features minimize power consumption during:
  - Normal operation
  - Standby (Sleep) modes
  - Panel-Off Power-Saving Mode
- Flexible onboard Activity Timer facilitates ordered shut-down of the display system
- Power Sequencing control outputs regulate application of Bias voltage, +5 V to the panel and +12 V to the inverter for backlight operation
- SMARTMAP™ intelligent color to gray scale conversion enhances text legibility
- Text enhancement feature improves white text contrast on flatpanel displays
- Fully Compatible with IBM™ VGA

65545 Display Capabilities

CRT Mode Resolution	Color [4]	Mono LCD Gray Scales [4]	DD STN LCD Colors [2, 3, 4]	9-Bit TFT LCD Colors [1, 2, 3, 4]	Video Memory	Simultaneous Display
320x200	256 /256K♦	61 / 61	256 / 226,981	256 / 185,193	512 KB	yes
640x480	16 / 256K♦	16 / 61	16 / 226,981	16 / 185,193	512 KB	yes
640x480	256 / 256K♦	61 / 61	256 / 226,981	256 / 185,193	512 KB	yes
800x600	16 / 256K♦	16 / 61	16 / 226,981	16 / 185,193	512 KB	yes with 1 MB
800x600	256 / 256K♦	61 / 61	256 / 226,981	256 / 185,193	512 KB	yes with 1 MB
1024x768	16 / 256K♦	16 / 61	16 / 226,981	16 / 185,193	512 KB	yes with 1 MB
1024x768	256 / 256K♦	61 / 61	256 / 226,981	256 / 185,193	1 MB	yes
1280x1024	16 / 256K♦	16 / 61	n/a	n/a	1 MB	n/a

Notes:

1 Larger color palettes and simultaneous colors can be displayed on 12-Bit, 18-Bit, and 24-Bit TFT panels via the 65540/545 video input port.
2 Includes dithering.
3 Includes frame rate control.
4 Colors are described as number of simultaneous on-screen colors and number of unique colors available in the color palette. 256K colors assumes DAC output mode is set to 6 bits of R, G & B. If DAC is set to 8-Bit output mode, the number of available colors is 16 M.

VGA Controller Chips

C&T	65545	32bit local bus	up 1024kRAM	hardware accelerator

CRT Displays

The 65545A supports resolution fixed frequency and variable frequency analog monitors in interlaced and non-interlaced modes of operation. Digital monitor support is also built in.

Supported VGA Modes

Mode:	Type:	Colors:	CRT:	Text:	Graphic:	DRAM:	Monitor:	Refresh/HR:
0,1	Text	16	ABC	40 x 25	320 x 200	256k	CGA	70 Hz
2,3	Text	16	ABC	80 x 25	640 x 200	256k	CGA	70 Hz
4,5	Graphic	4	ABC	40 x 25	320 x 200	256k	CGA	70 Hz
6	Graphic	2	ABC	80 x 25	640 x 200	256k	CGA	70 Hz
7+	Text	Mono	ABC	80 x 25	720 x 350	256k	HGC	70 Hz
D	Planar	16	ABC	40 x 25	320 x 200	256k	CGA	70 Hz
E	Planar	16	ABC	80 x 25	640 x 200	256k	CGA	70 Hz
F	Planar	Mono	ABC	80 x 25	640 x 350	256k	EGA	70 Hz
10	Planar	16	ABC	80 x 25	640 x 350	256k	EGA	70 Hz
11	Planar	2	ABC	80 x 30	640 x 480	256k	VGA	60 Hz
12/12+	Planar	16	ABC/BC	80 x 30	640 x 480	256k	VGA	60 Hz/72Hz
13	Planar	256	ABC	40 x 25	320 x 200	256k	CGA	70 Hz (not 8 Bit Bus)
20	4 Bit Lin	16	ABC	80 x 30	640 x 480	512k	VGA	60 Hz
22	4 Bit Lin	16	BC	100 x 37	800 x 600	512k	SVGA	60 Hz
30	8 Bit Lin	256	ABC	80 x 30	640 x 480	512k	VGA	60 Hz/72 Hz
32	8 Bit Lin	256	BC	100 x 37	800 x 600	512k	SVGA	60 Hz/72 Hz
60	Text	16	ABC	132 x 25	1056 x 400	256k	MGA	68 Hz
61	Text	16	ABC	132 x 50	1056 x 400	256k	MGA	68 Hz
72	Planar	16	C	128 x 48	1024 x 768	512k	HVGA	60 Hz
79	Packed	256	ABC	80 x 30	640 x 480	512k	VGA	72 Hz
7C	Packed	256	BC	100 x 37	800 x 600	512k	SVGA	72 Hz

supported on MSM486DX boards version 4.0 with 1Mbyte videoram.

24	4 Bit Lin	16	C	128 x 48	1024 x 768	1024k	HiVGA	60 Hz
26	4 Bit Lin	16	BC	128 x 48	1024 x 768	1024k	HiVGA	43 Hz
34	8 Bit Lin	256	C	128 x 48	1024 x 768	1024k	HiVGA	60 Hz
36	8 Bit Lin	256	BC	128 x 48	1024 x 768	1024k	HiVGA	43 Hz
40	15 Bit Lin	32k	ABC	80 x 30	640 x 480	1024k	VGA	60 Hz
41	16 Bit Lin	64k	ABC	80 x 30	640 x 480	1024k	VGA	60 Hz
7E	Packed	256	C	128 x 48	1024 x 768	1024k	HiVGA	60 Hz

A = PS/2 fixed frequency analog monitor;
B = Multifrequency CRT monitor like NEC Multisynch 3D or eq.
C = Nanao/EIZO 9070, NEC Multisynch 5D, or eq.

Simultaneous Flatpanel / CRT Display

The 65540/45 provides simultaneous display operation with Multi-Sync variable frequency or PS/2 fixed frequency CRT monitors and single panel-single drive LCDs (LCD-SS), dual panel-single drive LCDs (LCD-DS), dual panel-dual drive LCDs (LCD-DD) and plasma and EL panels (which contains single panel-single drive interfaces). Single drive panels sequence data in the same manner as CRTs so the 65540/45 provides simultaneous display with CRTs and LCD-SS, LCD-DS, plasma or EL panels by driving the panels with CRT timing. No external hardware is required. In contrast, LCD-DD panels require video data alternating between separate locations in the memory. In addition, a dual-drive panel requires data from both locations simultaneously. The 65540/45 also provides simultaneous display with LCD-DD and CRT monitors without using external VRAMs.

The internal VRAM frame buffers offer significant advantages relative to competitors' DRAM frame buffers. A DRAM frame accelerator requires that the flatpanel is refreshed at double of the CRTs vertical refresh rate. Therefore, an expensive 6.3 MHz LCD (with 120 Hz panel vertical refresh rate) is required for simultaneous display with 60 Hz CRT monitors when a DRAM frame buffer is used. Due to its higher bandwidth relative to DRAMS, a VRAM frame buffer can refresh both the flatpanel and CRT at the same vertical refresh rate. Therefore, inexpensive 3 MHz and 6 MHz LCDs (in addition to 6.3 MHz LCDs) can be used for simultaneous display with 60 Hz and 72 Hz CRT monitors when a VRAM frame buffer is used.

Simultaneous Display

CRT:	+	Flatpanel type:	Needed modifications:
CRT	+	Mono Single Drive STN LCD	none
CRT	+	Mono Dual Drive STN LCD	none
CRT	+	Mono Single Drive TFT LCD	none
CRT	+	Color Single Drive STN LCD	none
CRT	+	Color Single Drive TFT LCD	none

3.2 VGA/LCD BIOS Support

Each LCD display needs a specific adapted VGA-BIOS.
Standard this product is equiped with the CRT standard VGABIOS.

To connect a LCD Display to this product, you need to perform the following:

1. Check the FP_LIST.PDF if the LCD BIOS is available.
   Get the latest VGA-BIOS at our webpage http://www.digitallogic.ch

4 SOFTWARE

4.1 Available Drivers

he MICROSPACE Application CD contains a lot of various drivers.

CD:\drivers\display\vga45\	Drivers for
dos	DOS
nt4	Windows NT4.0
w95_vl	Windows 95 VESA
win311	Windows 3.11
win311_vl	Windows 3.11 VESA
win95	Windows 95

5 Description of the Connectors

5.1 VGA-Connector Analog Interface for Monitors

VGA-Connector		MICROSPACE Product
Signal Name	Sub-D 15 pol	MSMVGA/L
	Pin No.	Header Pin No.
VGA red	1	32
VGA green	2	34
VGA blue	3	36
Horizontal Sync.	13	38
Vertical Sync.	14	39
Ground	7	31
Bridge	8 + 11	

5.2 VGA Connector for Flatpanel Display

J4 LCD Connector

VGA-LCD Interface (flatpanel signals):

Signals P20-P23 are located on the J4M connector

Pin	Signal	Pin	Signal
1	M-Signal (altern. DE)	2	FLM
3	P18	4	Line Pulse LP
5	VCC	6	GND
7	Switched VDD (5V/1A)	8	Shift Clock
9	Switched B'light (12V/1A)	10	P3
11	P2	12	P17
13	P1	14	P16
15	P0	16	P7
17	Enable VEE (TTL)	18	P6
19	VCC Panel (5V/3,3V)	20	P5
21	P4	22	P19
23	P8	24	P9
25	P10	26	P11
27	P12	28	P13
29	P14	30	P15

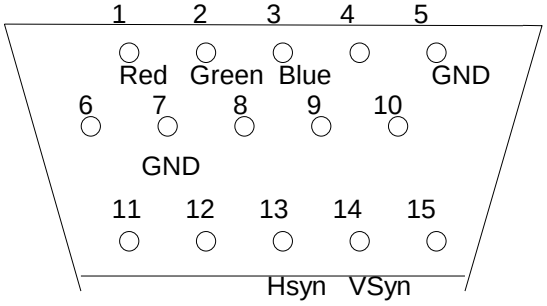
The Pin 9 is supplied from (+12V) .

J4 VGA Monitor (CRT-Signals)

J4 Header		15 pins HiDensity DSUB	
40 Pin	Signal	Pin	Signal
Pin 32	VGA red	Pin 1	Red
Pin 34	VGA green	Pin 2	Green
Pin 36	VGA blue	Pin 3	Blue
Pin 38	Horizontal Synch	Pin 13	H-Synch
Pin 39	Vertical Synch	Pin 14	V-Synch
		Pin 8 + 11	Bridge
Pin 31	Ground	Pin 7	Ground
		Pin 5	not connected
Pin 33	LCD-P20		
Pin 35	LCD-P21		
Pin 37	LCD-P22		
Pin 40	LCD-P23 or VEE *		

The VGA-CRT signals from J4 must be wired to a standard VGA HiDensity DSub connector (female):
*) Pin40 function is selected by the J27.

Solderside view of the female 15pin HiDSub



6 JUMPER LOCATION ON THE BOARD

6.1 The Jumpers on this MICROSPACE product

6.1.1 Flatpanel Interface

Flatpanel Interface:		1 - 2	2 - 3
J6	Flatpanel Interface: VEE-Polarity	negative -35V	positive +35V

6.1.2 Standby the VGA Controller:

Standby the VGA Controller:		1 - 2	2 - 3
J9 (smd jumper)	Standby the VGA Controller: StnBY	active (Default)	Standby

6.1.3 Selection of the BIOS Address

	Function:	Jumper Position, Address:	Jumper Position, Address:
J10	Selection of the BIOS Address **FLASH** Boot process: Flash Operation	1-2 = C000	2-3 = C800

6.1.4 16-Bit CPU Interface:

16-Bit CPU Interface:		Default-16 Bit:
J13 (smd jumper)	SMEMR-MEMR	closed = not used **open = 16Bit**
J14 (smd jumper)	SMEMW-MEMW	closed = not used **open = 16Bit**

6.1.5 Selection of the Flash Sector

(for using C800-CFFF, as alternate Flash-BIOS Memory, use the 64k-GAL. The standard implementation is 32k-GAL!)

J18, J19	Selected Sector:	J18	J19
	Sector 1 (Default)	open	open
	Sector 2	closed	open
	Sector 3	open	closed
	Sector 4	closed	closed

6.1.6 VEE Generator supply

If there is an external 12V power supply at the PC/104 BUS PIN B9, switch the Jumpers J25 and J26 to 2-3. With 12V at the VEE generator the stability of the VEE range is improved. VEE Range -35V to +35V.

Jumper	Function	PIN	PIN
J25	VEE Generator supply	1-2 = 5V *	2-3 = 12V
J26	VEE Generator supply	1-2 = 5V *	2-3 = 12V

- Default

6.1.7 Enable VEE Output at the J4

Pin 40 is selectable to output VEE supply or the P23

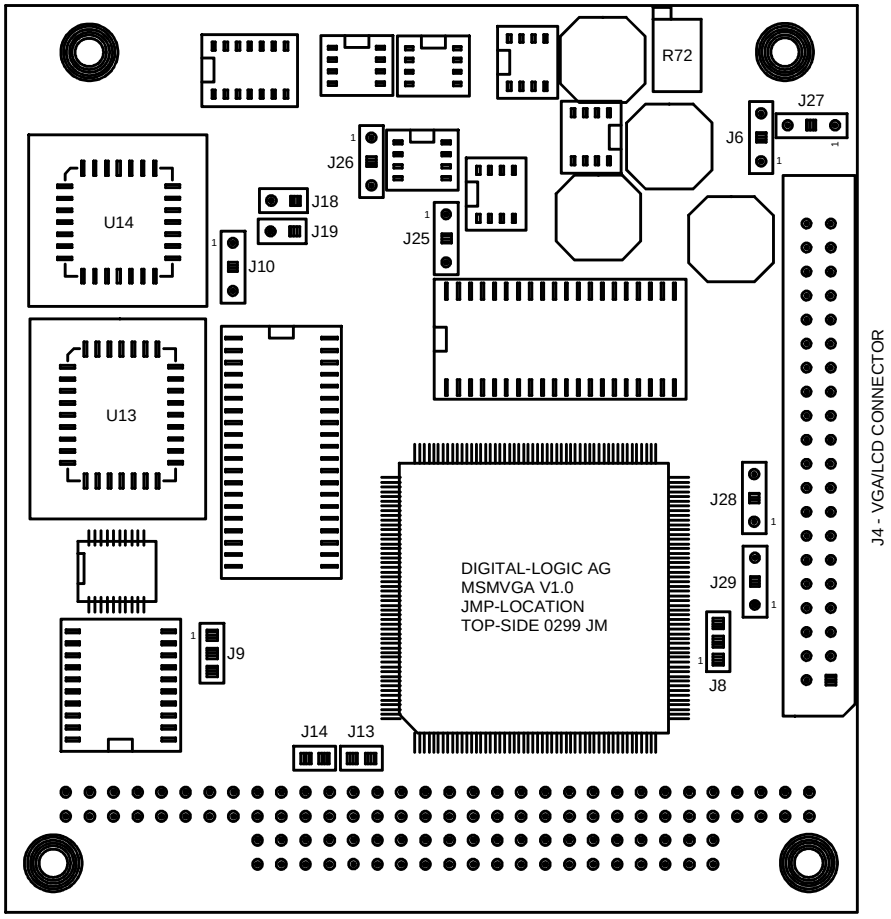
ATTENTION:

Select never the J27 to VEE-Output if a LCD is connected with the digital P23 signal on the Pin 40 of the J4 (LCD-Outputconnector) !

The LCD will be destroyed immediately with the overvoltage of the VEE generator !

Jumper	Function
J8	N/A
J28	N/A
J29	N/A

6.2 Jumper Locations



7 SPECIAL PERIPHERALS, CONFIGURATION, FUNCTIONS

7.1 Onboard BIAS Power generation (only on the MSMV104L)

On the MSMV104L (low cost) board is no BIAS generator implemented.

IMPORTANT:

The onboard voltage generation must be adjusted and measured before the LCD panel is connected, otherwise the display may be destroyed.

Follow these steps:

7.1.1 VEE Generation

If there is an external 12V power supply at the PC/104 BUS PIN B9, switch the Jumpers J25 and J26 to 2-3. With 12V at the VEE generator the stability of the VEE range is improved. VEE Range -35V to +35V.

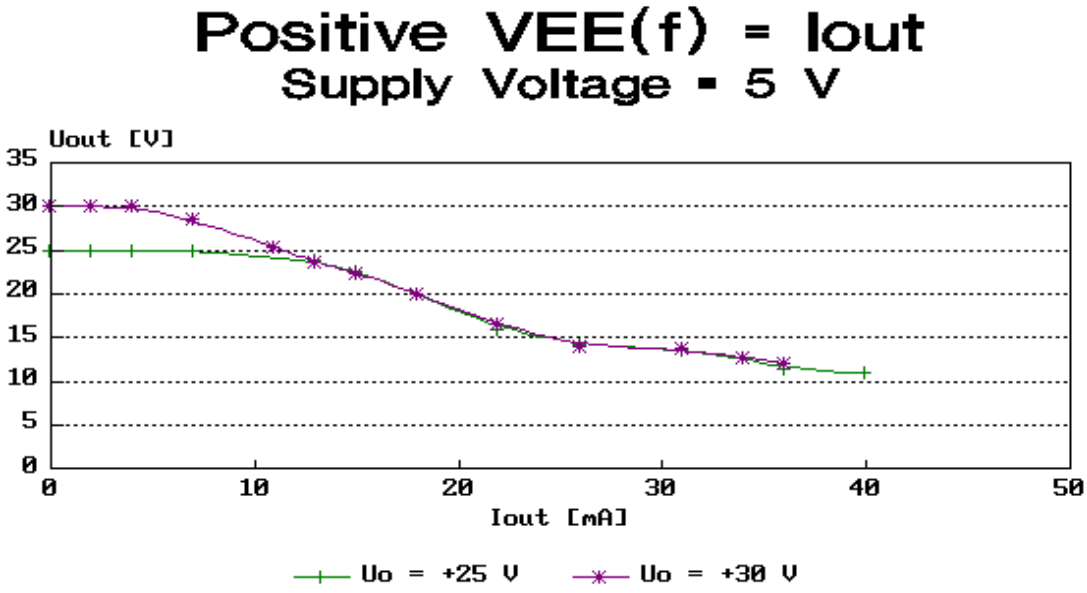
7.1.2 Selection of the polarity VEE

Some displays use positive, other use negative BIAS voltages. Refer to the datasheet of the flatpanel in order to find out the correct polarity. With the polarity jumper J6 (see Jumper) the definition is made.

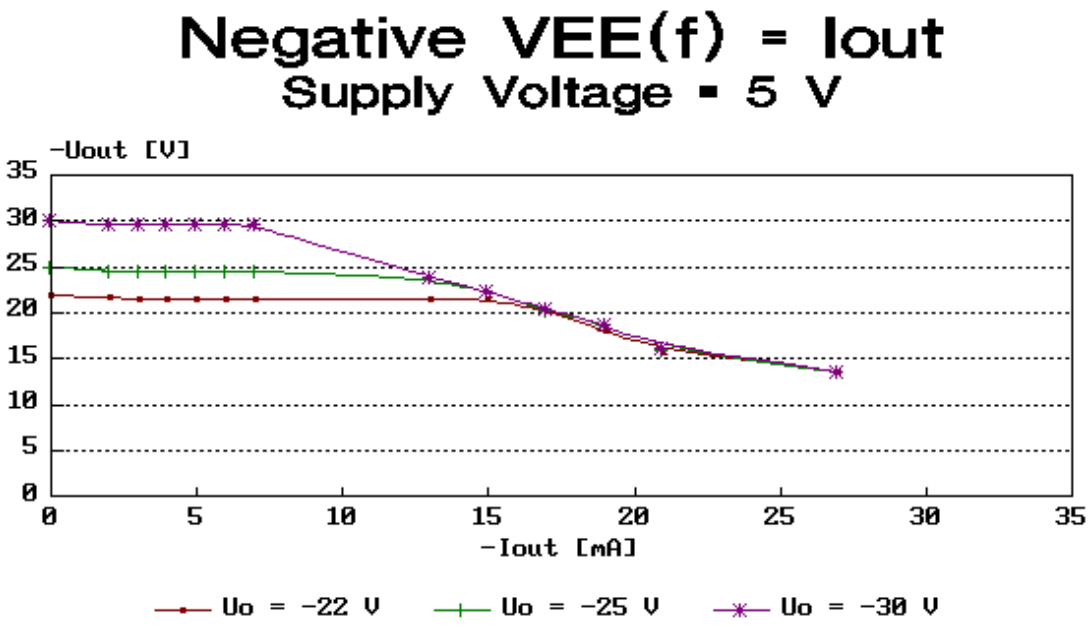
7.1.3 Adjustment of the voltage

The voltage may be varied between 35V and 15V with the selected polarity.
The current depends on the input voltage and the load. Check the following diagrams:

7.1.3.1 Positive voltage with 5V input



7.1.3.2 Negative voltage with 5V input



8 POSSIBLE FAILURES

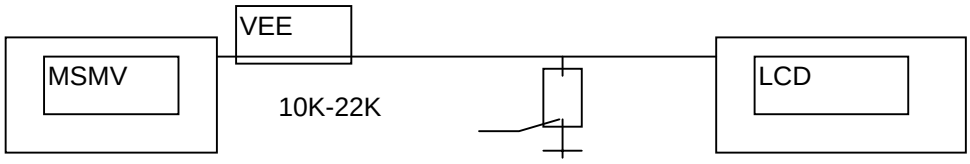
8.1 General LCD Failures

Refer to the Flatpanel Manual by DIGITAL-LOGIC AG.

1. Check the LCD-BIOS. You have a special BIOS for every LCD.
2. Check the cable to the LCD.
3. Check the Jumper.
4. Check the power supply.

8.2 The LCD is not stable

Try to place a resistor at the VEE to the GND.



This occurs to LCDs which do not consume enough current. Try to raise the resistor values as much as possible.

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